HyGridConvert 1.1.0 User's Guide

March 8, 2017[1]

1. Introduction

This document describes the design of HyGridConvert 1.1.0 and usage instructions. HyGridConvert converts a set of binary output files containing deposition and air concentrations, generated using the GenHysplit code, into binary files that can be read by MACCS2. The GenHysplit output files can contain results on a rectangular or polar grid. HyGridConvert transforms the results to a polar grid, based on a file generated by WinMACCS. The converted binary files are formatted to be used by MACCS.

2. Code Structure

HyGridConvert 1.1.0 is written in Fortran. The HyGridConvert code, 'HyGridConvert.exe', operates in two steps:

1. The first GenHysplit output file read by HyGridConvert is used to determine the HYSPLIT grid or set of grids that were used. The HYSPLIT grid(s) combined with the polar grid definition file are used to calculate the conversion matrix of results from the HYSPLIT grid(s) to the MACCS2 grid.
2. The conversion matrix is applied to each GenHysplit output file in the directory to generate the converted results.

3. Assumptions

HyGridConvert has the following assumptions:

1. The GenHysplit output files have the suffix of .ccd.
2. All the GenHysplit files in the directory have the same grid or grid set definition.
3. The HYSPLIT grids are centered on the release location.
4. The HYSPLIT grids have equal spacing in the x- and y-directions or r- and θ- directions, but are not necessarily equal to each other.
5. The earth is a sphere with a radius of 6,378.1 km (used to convert from latitude/longitude to km).

These assumptions can be changed in the source code later if they become obsolete or invalid.

4. Running the Code

HyGridConvert is written in Fortran and compiled into the executable 'HyGridConvert.exe'. HyGridConvert can be run using WinMACCS or by typing 'HyGridConvert.exe' followed by command-line options. If the command-line options are not specified, a syntax statement is

[1] Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525. SAND2020-5314O

produced showing the command-line syntax. There are five valid command-line options as follows:

1. -h ‘path’, required, where path is the folder name containing the GenHysplit output file to be converted.
2. -i ‘file’, required, where file is the name of the file (generated by WinMACCS or by hand) containing the polar grid definitions for MACCS.
3. -o ‘path’, required, where path is the folder name where the converted files should be placed.
4. -p ‘name’, optional, default = ‘HyGridConvert’, where name is the prefix that is attached to the output .log, .stat and .hyinp files. This can also contain a relative path from the output path defined by –o, so that these files can be placed in a different folder than the converted files.
5. -e , optional, causes the HYSPLIT results to be extrapolated all the way to the largest radius in the MACCS grid, when the MACCS grid is larger than the HYSPLIT grid, instead of being imposed onto the MACCS radii within the HYSPLIT grid.
6. –t ‘time(sec)’, optional, averages the output into larger time periods. Must be a multiple of the input file time period, divide evenly into 60 minutes, and be no greater than one hour. For example, if the input file has a time spacing of 15 minutes, the output file could be consolidated in the output to 30 minutes or 1 hour.

5. Input Files

The input files for HyGridConvert are the site file (located in the path with the specified name given with the -i command-line option) and the GenHysplit output files ‘*.ccd’ (located in the path set by the -h command-line option). The site file defines information on the polar grid used by MACCS, along with other site information. The GenHysplit output files contain the HYSPLIT grid information and the concentration results.

6. Output Files

The output files for HyGridConvert are ‘*.mcd’ files, where the * matches the names of the GenHysplit output files ‘*.ccd’. These are placed in the directory specified using the -o command-line option. HyGridConvert also generates a ‘HyGridConvert.log’ file, ‘HyGridConvert.stat’ file and ‘HyGridConvert.hyinp’ file (which have a different prefix than HyGridConvert if the -p command-line option is used) in the output directory. The ‘HyGridConvert.log’ file contains the code version and run information, along with the MACCS and HYSPLIT grid definitions and the names of the files that were converted. The ‘HyGridConvert.stat’ file reports the status of the run; the file contains ‘OK’ for a successful run and ‘NO’ followed by an error message for an unsuccessful run. The ‘HyGridConvert.hyinp’ file contains a copy of the input file and log file used to generate the GenHysplit output files for reference, if these files are present in the GenHysplit output file directory.

7. Input File Contents and Valid Ranges

The site file should contain the following key words; if not the default values are used.

1. ‘Latitude:’, followed by a number between -90 and 90, in degrees and decimal notation, default = 0.
2. ‘Longitude:’, followed by a number between -180 and 180, in degrees and decimal notation, default = 0.
3. ‘Number_Angles:’, followed by an integer greater than 0 that defines the number of compass sectors, default = 0.
4. ‘Number_Radii:’, followed by an integer greater than 0 that defines the number of radii, default = 0.
5. ‘Radii:’, followed by a list of numbers greater than 0, in ascending order, that do not repeat, default = 0. The number of radii must be specified before the radius values.